

Week 13

IGCSE Mathematics

Homework bundle for this week

本周作业合集

exercises.lol

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1. The point $(-4, 3)$ is in which quadrant?

☐ I

☐ II

☐ III

☐ IV

2. Find the gradient of the line through $(1, 2)$ and $(4, 11)$.

3. Find the length of the segment from $(1, 2)$ to $(4, 6)$.

4. Rearrange $5x + 4y = 8$ into $y = mx + c$. What is c (the y -intercept)?

5. A line is parallel to $y = 4x - 1$ and passes through $(1, -3)$. In $y = 4x + c$, what is c ?

6. The point where the x -axis and y -axis cross is called the _____.

7. A line that goes down as you move to the right has a gradient that is:

☐ negative

☐ positive

☐ zero

☐ undefined

8. The midpoint of $(1, 2)$ and $(4, 6)$ is $(a, 4)$. What is a ?

9. A line has gradient $3/2$. The gradient of a line perpendicular to it is:

☐ $-2/3$

☐ $2/3$

☐ $-3/2$

☐ $3/2$

10. In $y = mx + c$, the letter m stands for the:

- ☐ gradient
- ☐ y-intercept
- ☐ x-value
- ☐ midpoint

1. **II**

Negative x (left) and positive y (up) $\rightarrow$ quadrant II (top-left).

2. **3**

$$(11 - 2)/(4 - 1) = 9/3 = 3.$$

3. **5**

$$\sqrt{((4-1)^2 + (6-2)^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5.$$

4. **2**

$$4y = -5x + 8, \text{ so } y = -(5/4)x + 2; \text{ the intercept is } 2.$$

5. **-7**

$$\text{Parallel} \rightarrow \text{same gradient } 4. \quad -3 = 4(1) + c, \text{ so } c = -7.$$

6. **origin**

The origin is the point $(0, 0)$ where the two axes meet.

7. **negative**

Falling to the right means the change in y is negative for a positive change in x , so the gradient is negative.

8. **2.5**

$$\text{Average the } x\text{-values: } (1 + 4)/2 = 2.5.$$

9. **$-2/3$**

$$\text{Flip and change sign: perpendicular gradient} = -1 \div (3/2) = -2/3.$$

10. **gradient**

m is the gradient (steepness); c is the y -intercept.

E3.1 Coordinates

Name: _____ Class: _____ Date: _____

Total: 11 marks**KEY WORDS** coordinates 坐标 • midpoint 中点 • length 长度 • origin 原点 • line segment 线段

Objective

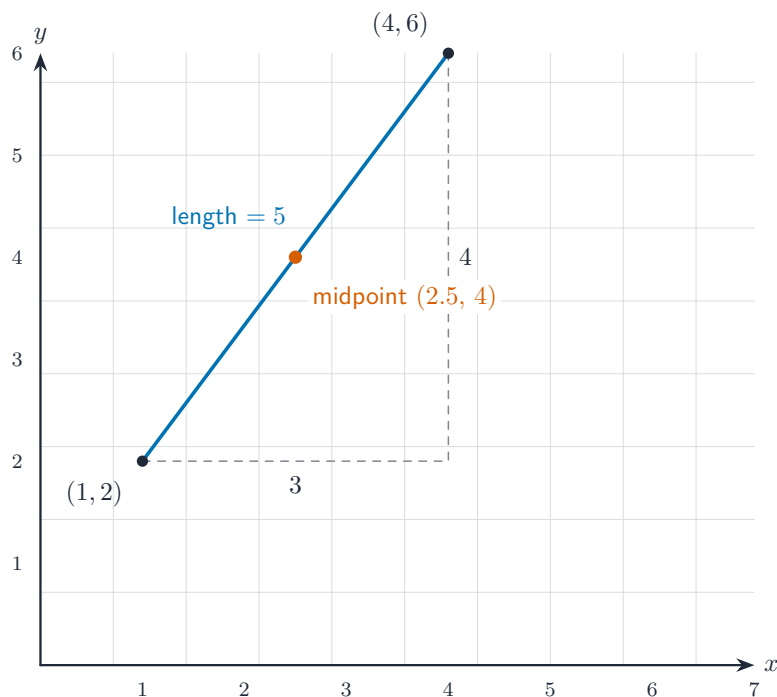
Build the skills to answer Extended exam questions on **coordinates** 坐标 — plotting points, and finding the **length** 长度 and **midpoint** 中点 of a line segment.

You must be able to:

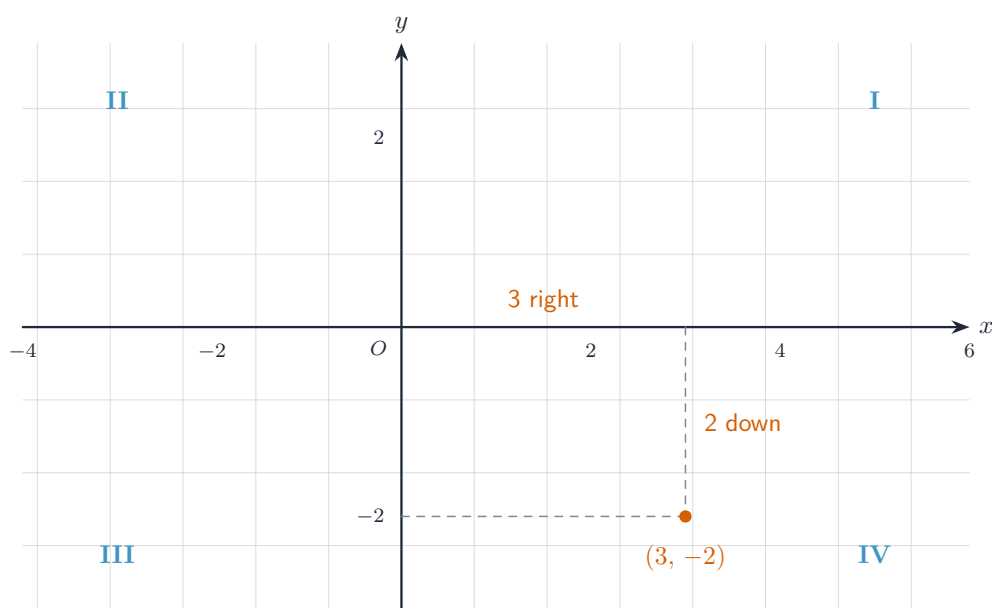
- plot and read coordinates (x, y)
- find the length of a segment using Pythagoras
- find the midpoint of a segment

1 Worked examples

■ Length and midpoint



(x, y) : first across, then up



Points are plotted on the coordinate plane

$$\text{length} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

- **Worked** (1, 2) to (4, 6): length = $\sqrt{3^2 + 4^2} = 5$; midpoint = (2.5, 4).

Answer shapes: **M1** a correct method, **A1** the correct answer.

2 Practice

2.1 Find the midpoint of the segment joining (2, 3) and (6, 9). [2]

2.2 Find the length of the segment from (0, 0) to (3, 4). [2]

2.3 Write down the coordinates of the point 3 left and 2 up from the origin. [1]

3 Exam-style questions

3.1 $A = (1, 1)$ and $B = (7, 9)$.

(a) Find the midpoint of AB . [2]

(b) Find the length of AB . [2]

3.2 $M(3, 5)$ is the midpoint of PQ . Given $P = (1, 2)$, find the coordinates of Q . [2]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 $\left(\frac{2+6}{2}, \frac{3+9}{2}\right) = (4, 6).$

2.2 $\sqrt{3^2 + 4^2} = \sqrt{25} = 5.$

2.3 $(-3, 2).$

3.1 (a) $\left(\frac{1+7}{2}, \frac{1+9}{2}\right) = (4, 5).$ (b) $\sqrt{(7-1)^2 + (9-1)^2} = \sqrt{36 + 64} = \sqrt{100} = 10.$

3.2 if M is the midpoint, $Q = (2 \times 3 - 1, 2 \times 5 - 2) = (5, 8).$

- 17** B is the point $(-3, 1)$ and D is the point $(-5, 9)$.
 BD is a diagonal of the kite $ABCD$.

- (a)** The ratio of the lengths of the diagonals $BD : AC = 2 : 3$.

Work out the length of AC .

Give your answer as a surd in its simplest form.

..... [5]

- (b)** Find the coordinates of the midpoint of BD .

(..... ,) [2]

- (c)** The diagonal AC of the kite passes through the midpoint of BD .

Find an equation of AC .

Give your answer in the form $y = mx + c$.

E3.2 Drawing linear graphs

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS perpendicular 垂直 • parallel 平行 • gradient 斜率 • parallel and perpendicular 平行和垂直
 • drawing linear graphs 画直线图象

Objective

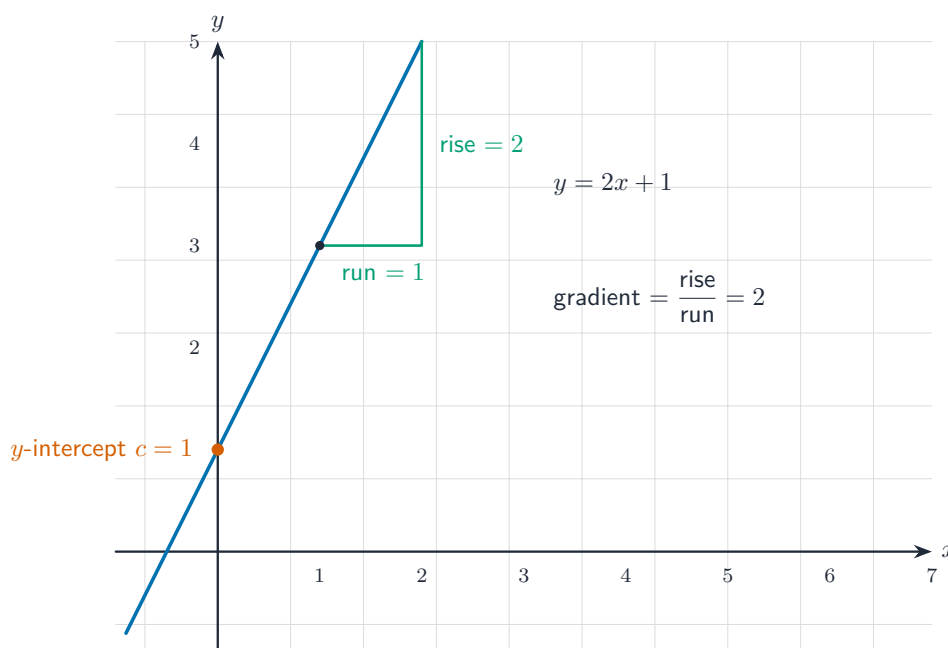
Build the skills to answer Extended exam questions on **drawing linear graphs** 画直线图象 — the equation $y = mx + c$, the **gradient** 斜率, finding the equation of a line, and **parallel and perpendicular** 平行和垂直 lines.

You must be able to:

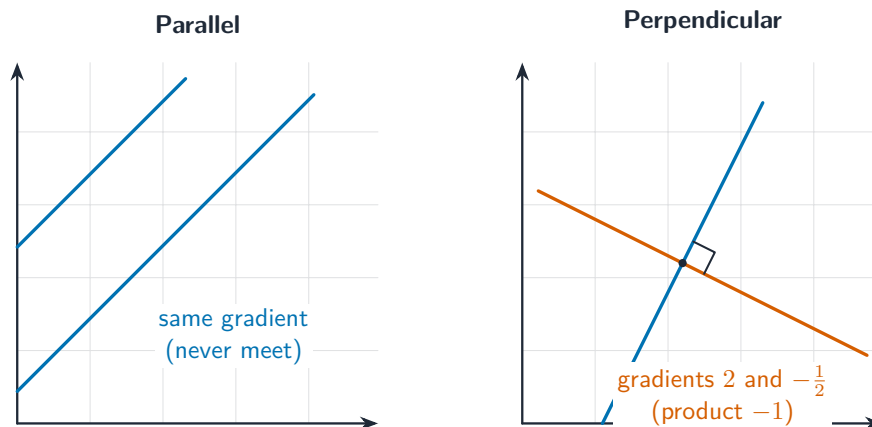
- find the gradient and y -intercept of a line
- find the equation of a line from its gradient and a point
- use the gradient rules for parallel and perpendicular lines

1 Worked examples

■ Straight lines



$$m = \text{gradient}, c = y\text{-intercept}$$



Gradients of parallel and perpendicular lines

- **Gradient** 斜率: $m = \frac{\text{change in } y}{\text{change in } x}$. Through $(1, 2)$ and $(4, 11)$: $m = \frac{9}{3} = 3$.
- **Equation:** gradient 3 through $(1, 2) \rightarrow 2 = 3(1) + c \rightarrow c = -1 \rightarrow y = 3x - 1$.
- **Parallel** 平行: same gradient. **Perpendicular** 垂直: $m_1 m_2 = -1$.

Answer shapes: **M1** a correct method, **A1** the correct answer.

2 Practice

2.1 Write down the gradient and y -intercept of $y = 4x - 3$. [2]

2.2 Find the gradient of the line through $(2, 1)$ and $(5, 10)$. [2]

2.3 Write down the gradient of a line parallel to $y = 2x + 7$. [1]

3 Exam-style questions

3.1 Find the equation of the line with gradient 2 that passes through $(3, 1)$. [3]

3.2 Rearrange $3x + 2y = 12$ into the form $y = mx + c$ and write down its gradient. [2]

3.3 Find the gradient of a line perpendicular to $y = \frac{1}{2}x + 4$. [1]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 gradient 4; y -intercept -3 .

2.2 $m = \frac{10-1}{5-2} = \frac{9}{3} = 3$.

2.3 2.

3.1 $y = 2x + c$; substitute $(3, 1)$: $1 = 2(3) + c \rightarrow c = -5 \rightarrow y = 2x - 5$.

3.2 $2y = -3x + 12 \rightarrow y = -\frac{3}{2}x + 6$; gradient $-\frac{3}{2}$.

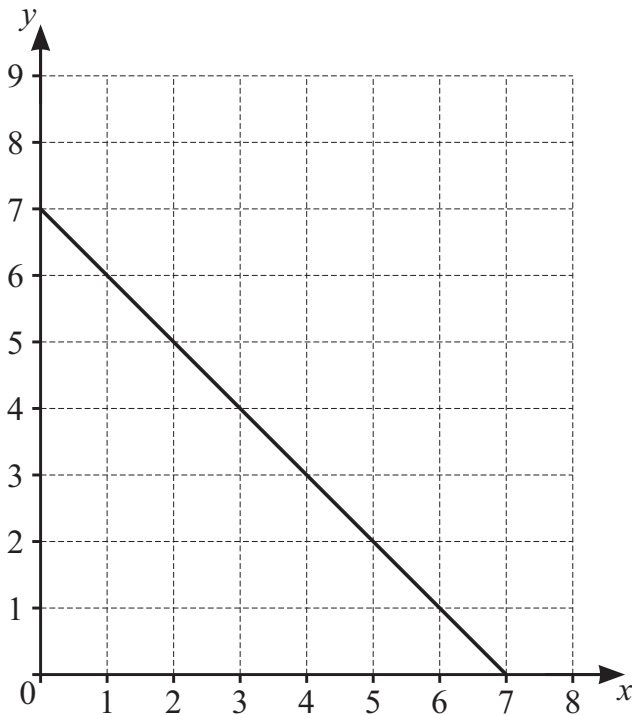
3.3 the gradient is $\frac{1}{2}$, so the perpendicular gradient is -2 (flip and change sign).

22 The equation of line L is $y = -\frac{1}{2}x + 7$.

Find an equation of the line perpendicular to line L that passes through the point $(3, 5)$.
Give your answer in the form $y = mx + c$.

$y = \dots\dots\dots$ [3]

6



The line $x + y = 7$ is drawn on the grid.

(a) On the grid, draw the line $y = 2x + 1$. [2]

(b) Use your graph to solve these simultaneous equations.

$x + y = 7$

$y = 2x + 1$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

[1]